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Significance of Decreasing Response Time for Social Questions by Using WhichOne, a Web 2.0 Application

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Significance of Decreasing Response Time for Social Questions by Using WhichOne, a Web 2.0 Application

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Report

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Abstract

Decreasing Response Time for Social Questions: a Web 2.0 Application

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Our busy lives confront us with multiple questions that need to be answered every day. We may come across questions in our lives that we can answer ourselves; while there are other questions we would like a second opinion. Then there are questions to which we simply do not know the answer. Proposed is WhichOne, a Web 2.0 application that allows users to obtain answers from other people.

The proposed social networking tool named WhichOne, allows a user to quickly prepare a question and share it with others. Using social networking tools shortens the time delay of getting responses. It also allows for a quick computation of statistics associated with multiple answers, and for an access to a large number of potential individual or group responders. A user can create a poll and list possible responses to the poll. Polls have a close time where people can vote until they are closed for voting. WhichOne is a prototype and has been active for over half a year now and received a variety of polls and responses from several users.

WhichOne obtains a faster response than email and phone calls because users using a desktop are able to share their polls using the AddThis service, which provides

300 different options for sharing their poll. When using WhichOne's mobile application available on Android, users are able to share their poll using the sharing options available on their phone, this includes but is not limited to Twitter, Facebook, texting, and Google hangout. Email is slower than WhichOne because emails have a tendency to not receive a response for several days, maybe weeks. Calling on the other hand is an intrusive and slow option especially with a muti respondent poll.

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Chapter 1

Introduction

Our busy lives confront us with multiple questions that need to be answered quickly and accurately every day. Some of the questions we can answer ourselves. Other questions we can answer but would like to get a quick second opinion from the experts we know. Some questions we cannot answer ourselves and we are forced to consult with others. A Web 2.0 web application that allows users to obtain a quick response from other people to a single question is discussed in this paper. Web 2.0 harnesses the Web in a more interactive and collaborative manner, emphasizing peers' social interaction and collective intelligence, and presents new opportunities for leveraging the Web and engaging its users more effectively [1].

1.1 Vision

The popularity of social networking in our society today has kept us connected with people that surround our lives. However, even with all the different social networks and Web 2.0, without WhichOne, receiving a timely answer to a single question is often difficult.

1.2 Key Technology

A Web 2.0 web application WhichOne was created to allow users to obtain answers from other people. Web-based social networks, online personal profiles, keyword tagging, and online bookmarking are staples of Web 2.0-style applications [2]. WhichOne supports many features of Web 2.0, including social networking, online personal profiles, and keyword tagging. The web application will relies upon user-

generated content (e.g., photos, text and videos) while allowing continuous interaction among participants [3].

1.3 How WhichOne is Different

WhichOne has contributed in the following ways:

- WhichOne contributed the idea that a user could improve response time by using social networking.
- WhichOne has a web and mobile application with social sharing.
- WhichOne is a prototype with actual cases where users have created polls where users where able to obtain answers within close time.

There are many polling or survey web applications available today. Previous work has focused on handling large number of questions in situations where a short response time is not critical. WhichOne is different; it focuses on a single question, a quick response, and an optional focused audience through social networking. Focusing on a single question poll allows the users to clearly define the current question troubling them. After the question is written, the user can quickly create and share the poll with the target audience. Having a web application that allows a user to share polls with respondents or others through social networking provides a competitive advantage over previous work. A mobile application for WhichOne will provide an even greater competitive advantage with capacity to create a poll and obtain responses even faster.

1.4 The Remainder of the Report is Structured as Follows

The remainder of the report is structured as follows. Chapter 2 describes the specifications and requirements, including user stories, mockups and performance goals for the web application. Chapter 3 reviews the technology stack, what technology was used to create WhichOne. Chapter 4 is about WhichOne architecture. In this chapter design decisions and tradeoffs for WhichOne are discussed. Chapter 5 is about current results for WhichOne. Current screenshots of WhichOne are shown, as well as user feedback, new user stories, and details about lines of code, user behaviors, and timing from the web application. Lastly, Chapter 6 covers what has been done, future work, and features that would be nice to have for WhichOne, and additional information on prior work.

Chapter 2

Specifications and Requirements

WhichOne shall allow users to share questions with their social network and receive responses with an improved response time when compared to prior work. These questionscan range from “Which color car should I buy?” to “Where will Friday’s lunch take place?” WhichOne shall deliver content with a response time under 1 second. This response time is required for the web application to flow well and be considered as user friendly.

2.1 Functional Specifications: User Stories and Mocks

The following user stories illustrate a need for WhichOne. For example, a shopper at Nordstrom’s has to choose a Gucci or Ferragamo handbag. The shopper needs help and can ask friends for advice; which one of the two would you recommend? This user story lead to a number additional user stories which are listed below:

- As a granddaughter, I want to know where my family wants to celebrate grandpa’s 100th birthday so that we have a successful party.
- As an author, I want to know which book cover design looks the best so that I can sell more books.
- As a person looking to buy new shoes, I want to know which shoes would match my outfit so that I can look the best at a good price.
- As a curious person, I want to know which Olympic opening ceremony was the most memorable during the last 50 years.
- As a curious person, I want to know which jellybean flavor is my family’s favorite.

Each of these user stories includes a person with a question, an answer, and a target audience. The best way to get a question answered is using a poll and sharing it with the target audience. WhichOne will allow users to create polls and share them with their target audience using social networking and other share options available on their mobile platform. With that in mind several mockups for a web application were created and are shown below.

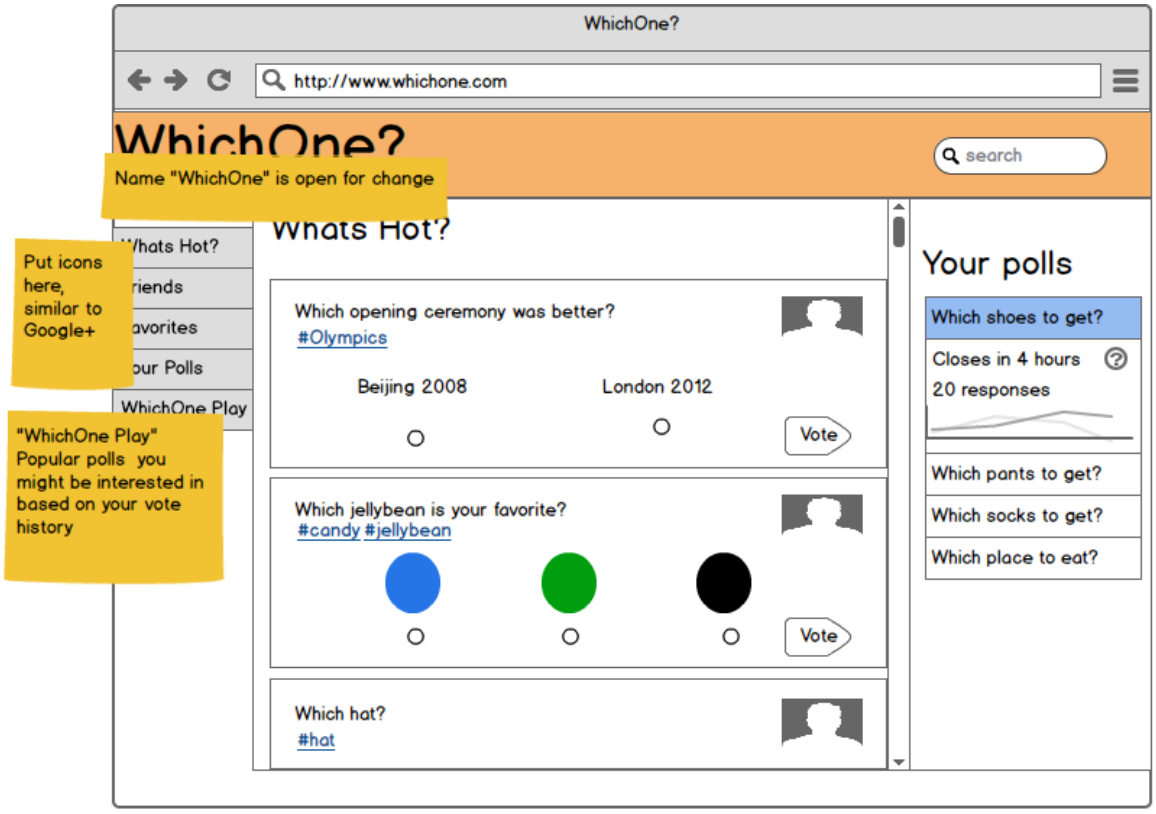


Figure 2.1: Whats Hot mockup

Figure 2.1 above, shows the main layout of the WhichOne web application. The left side of the page is for navigation. Navigation includes links to pages where popular

polls will be displayed, friend's polls, favorite hash tags, the user's polls, and a random poll suggestion page. The random poll suggestion page displays polls the user might be interested in based on the polls they create and polls they view. In the middle is a list of polls that are currently popular. Each poll in the center section displays the question for the poll, hash tags associated with the poll, the options for voters, the poll creator's image, and a vote button. On the right is a list of the user's polls and stats for one of the user's poll.

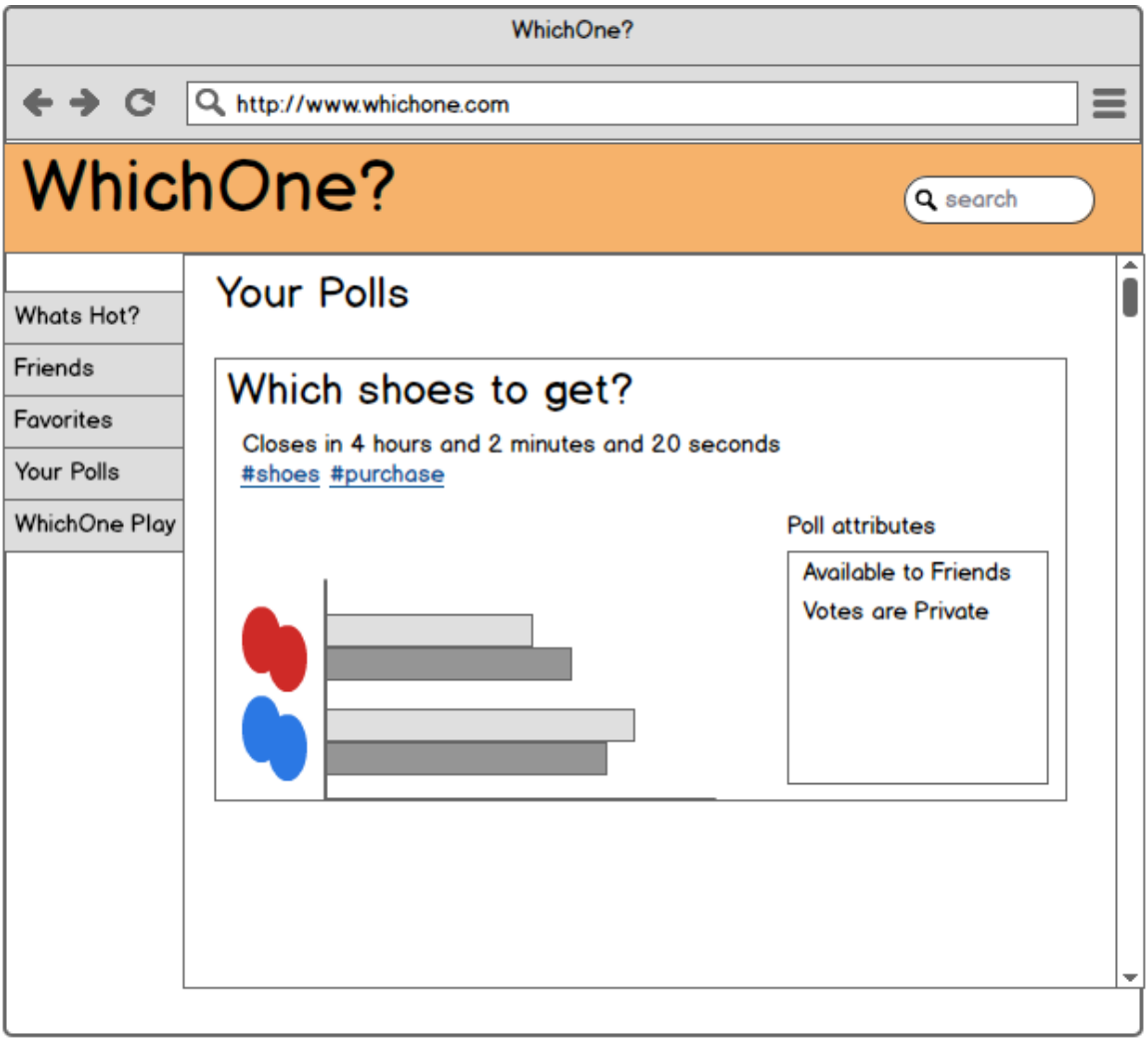


Figure 2.2: Your Polls page mockup

Figure 2.2 above, shows the view of a user's specific poll. Information displayed is from the creation of the poll as well as statistics collected from voters. Statistics currently will be who has voted for which item, but additional statistics can be collected about voters and displayed on the poll page.

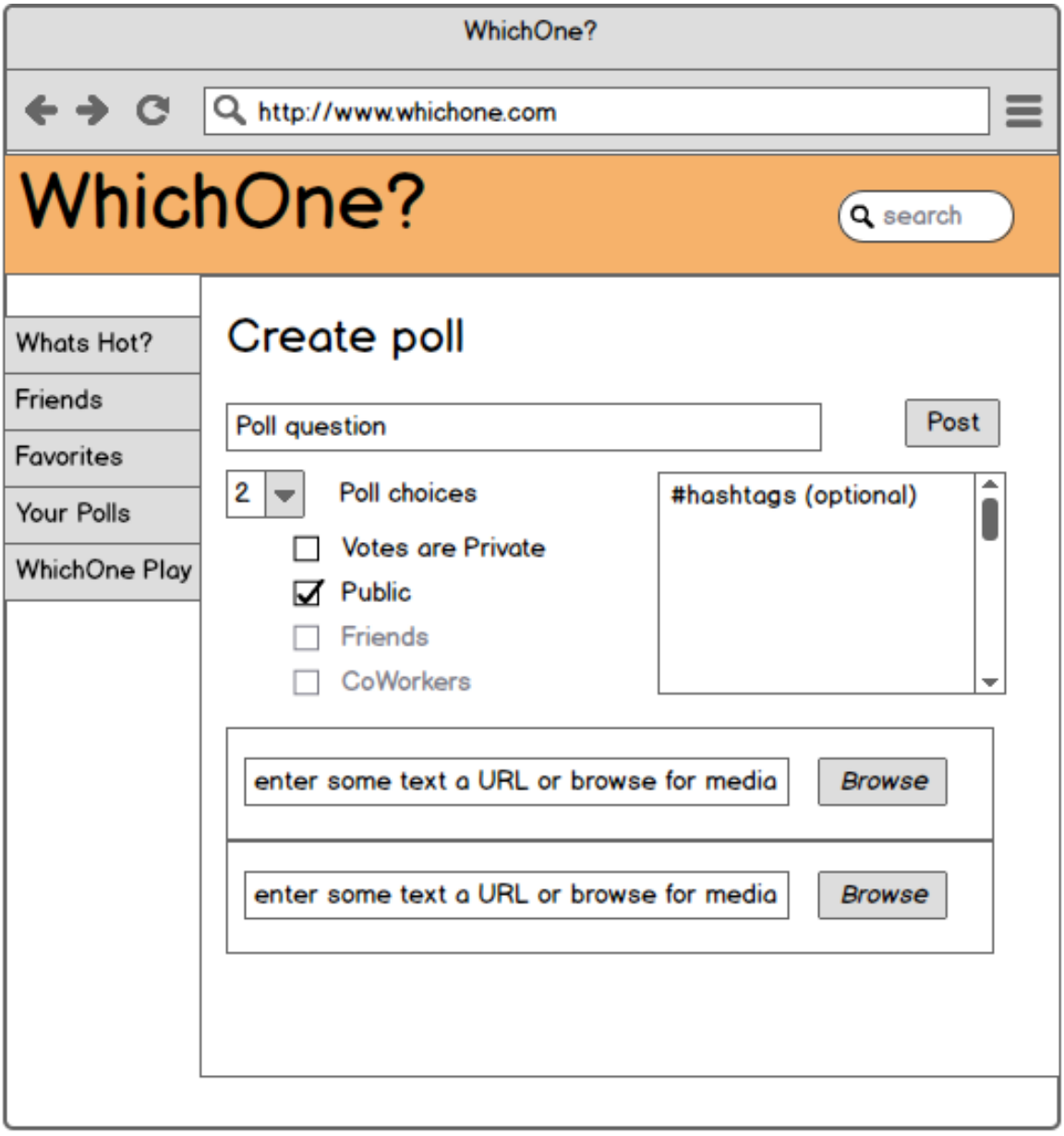


Figure 2.3: Create poll mockup

Figure 2.3 above, shows the "Create poll" page for WhichOne. This page contains the fields that need to be filled out to create a poll. The poll question and choices are not optional. Each poll requires at least two choices. The choices can be text, a link, or photo file. Optional fields for each poll are the configuration and hash tags. Creating a poll with

"Votes are Private" option enabled hides who voted for each choice in the poll. Checking the box next to Public makes the poll accessible to everyone. A poll created without this box checked would be "private" and need to be shared using the link to the poll.

Below Figure 2.4 shows the mockup for WhichOne viewed on a mobile platform. The web application will look similar on a mobile platform but will require modifications to improve navigation.

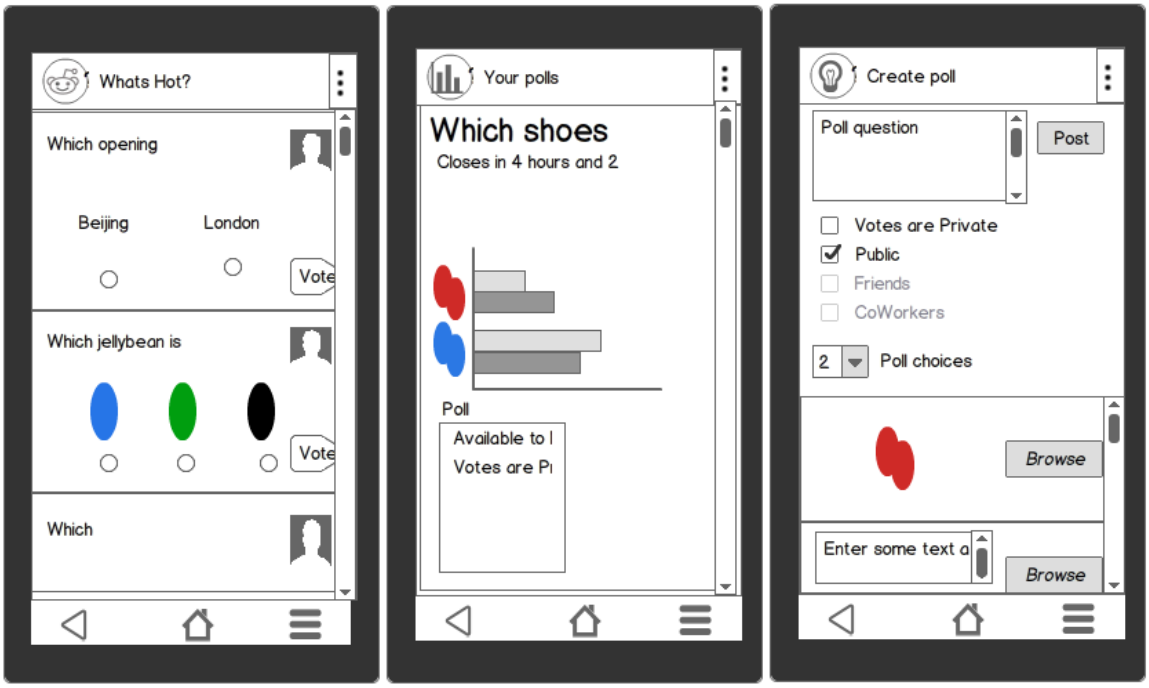


Figure 2.4: Mobile platform view mockup

2.2 Performance Goals

There are two main performance goals for WhichOne. First is the response time for the web application to load. The response time needs to be fast enough that the user is not waiting for content to load. Secondly, the cost of running WhichOne needs to be as low as possible.

The web application content is created by users; therefore the response time of the website is important. A goal of sub-800ms has been established. This value provides the user with a responsive web application and makes their experience more enjoyable.

2.3 WhichOne Site

The first prototype for WhichOne is a Web 2.0 web application. As said, social networks are characterized by a high degree of interactivity and an intrinsic sharing of information among participants, which connect each other's on a relationship base [16]. Such platforms are mostly accessed through web browsers, even if on mobile or handheld devices [16]. Creating a Web 2.0 web application made development fast, quick, and easy to test and update. The focus of Web 2.0 web applications is social networking. Rapid prototyping and development in the early stages of developing a web application is important. Web 2.0 is also called the wisdom Web, people-centric Web, participative Web, and read/write Web [1]. Web 2.0 harnesses the Web in a more interactive and collaborative manner, emphasizing peers' social interaction and collective intelligence, and presents new opportunities for leveraging the Web and engaging its users more effectively [1]. To meet these Web 2.0 requirements, WhichOne has hash tags and social networking share buttons.

User interactions are one of the aspects for future developments in web applications [14]. WhichOne's users need to interact and share with ease. Therefore there has to be an easy solution for the integration of community features like tagging [15]. Hash tags are optional and available for each poll. These tags are used to label a poll so

that other users can search for polls tagged with the same hash tag that might meet their interests. A user may want to see other people who have tagged on the same object that he or she tagged [2].

WhichOne provides social networking share buttons are available for each poll. The two buttons available are for sharing polls on Twitter and Google+. Twitter is ranked number two, and Google+ is ranked number four [17]. These two were chosen because of their popularity, and ease of implementing their share buttons.

In addition to making WhichOne a Web 2.0 web application, the decision of restricting one poll per question will separate WhichOne from previous work. By only allowing one question per poll, users creating polls can create them quickly and can expect a quick and focused response to their question.

Chapter 3

Review Technology Stack

There are two main components of WhichOne, a client and a server. The client-side is the user interface; the pages and content the user navigates through. Server-side consists of manipulating, retrieving, sending, and storing data. In order to develop these two main components, a set of development tools were required. The following section discusses the technology used for each of these main components, and tools used in development.

3.1 Client

The client-side provides a method for the user to interact with the web application. This is typically accomplished using a web browser that can render CSS, HTML, JavaScript, and occasionally Flash. WhichOne requires CSS, HTML, and JavaScript to render correctly. Meeting these client-side requirements will provide the user with full access to all features of WhichOne.

HTML is an acronym for Hyper Text markup Language. It is used to organize content on a web page. Content consists of creating lists, tables, text links to other html pages, images, or forms, and includes everything CSS is able to do for styling. WhichOne will use HTML to display polls and choices to users.

CSS is an acronym for Cascading Style Sheets. It is a style language that defines the layout and look of HTML. Style elements consist of fonts, colors, margins, lines, heights, and widths. CSS allows the control of multiple HTML documents from a single

location. The style sheet is included in the <head> section of the HTML document. WhichOne will use CSS for controlling the style of the web application.

JavaScript is a lightweight programming language. The JavaScript code can be inserted into HTML pages. It allows client-side data manipulation; including interaction with the user, control the browser, and alter the current HTML content. WhichOne will use JavaScript to provide social networking share features, and manipulate data available in the HTML.

To ensure users can connect and use WhichOne correctly, requirements for the client used by each user are important. Table 2.1 lists the names of the web browsers that accessed WhichOne over a six month period and the Pages viewed per Visit.

Browser	Browser Version	Pages / Visit	Visits
		13.11 Site Avg: **13.11** (0.00%)	**36** % of Total: **100.00%** (36)
1. Chrome	28.0.1500.44	**36.17**	16.67%
2. Chrome	27.0.1453.110	**18.00**	2.78%
3. Chrome	28.0.1500.47	**16.00**	2.78%
4. Firefox	21.0	**13.67**	8.33%
5. Chrome	28.0.1500.53	**10.00**	2.78%
6. Chrome	28.0.1500.37	**9.00**	11.11%
7. Chrome	28.0.1500.52	**8.75**	11.11%
8. Chrome	27.0.1453.90	**8.33**	8.33%
9. Chrome	26.0.1410.63	**8.00**	2.78%
10. Chrome	28.0.1500.45	**7.33**	8.33%
11. Chrome	28.0.1500.54	**5.17**	16.67%
12. Internet Explorer	10.0	**5.00**	2.78%
13. Chrome	25.0.1364.169	**4.00**	5.56%

Table 3.1: Client browser choice

The browser version data was collected using Google Analytics. Google Analytics is JavaScript that runs on the client and generates detailed statistics about visitors to a website. One important attribute for Web 2.0 is the ability to share. WhichOne will use a social networking button service provided by AddThis. The share buttons provided will enable users to share their polls in over 300 different ways.

3.2 Server

The server-side is required to manipulate, transfer, and store data. All of the data available to the client-side comes from the server. Several key components are required to make this possible: Apache HTTP server software with a module, Django web application framework, MySQL database with a plugin, and Amazon Web Services.

Apache HTTP server software is a web server software program. The software listens for HTTP requests. These requests come from the clients that want to access the website. When a request is received, Apache serves CSS, images, JavaScript, and HTML back to the client. Apache has a variety of modules available. These optional modules add a great degree of flexibility, and quick access to additional features and functions for the Apache web server. One of these modules is mod_wsgi. This specific plugin is used to run a Python script to generate the appropriate data. Mod_wsgi connects the Apache HTTP server to the Django framework.

Django is an open source web application framework. This framework eases the creation of complex, database-driven websites. When a user creates a poll, the data is sent to a function in Python. The data is manipulated and a response is returned to the user. This response passes from the Django framework through the Web Server Gateway Interface(WSGI) to the Apache http server. WSGI is a specification for web servers and application servers to communicate with web applications. Several features made website design easier. These features include the use of Python, free admin interface, and template system for HTML.

For storing data, a MySQL database was used. MySQL database server is known by the development team and does not introduce additional unknowns. The MySQL database stores all of the data for the web application. This includes the user's data, and all poll data. Using a MySQL database required a plugin to connect the Django

framework to the database. This connection was made using MySQLdb. MySWLdb provides a Python database application programming interface to interface with the MySQL database.

Amazon Web Services is a collection of web services provided by Amazon. From this collection of services, WhichOne took advantage of three: Amazon Elastic Compute Cloud(EC2), Route 53, and Simple Email Service(SES). These services are scalable and the user only pays for capacity that is actually used.

Amazon EC2 is a service that provides a virtual computing environment. WhichOne takes advantage of the EC2 instances. For WhichOne, a virtual Ubuntu 12.0 server instance was created with Amazon EC2 services. This virtual server is running on a micro instance and is connected to an 8 GiB volume that holds the MySQL database. Apache HTTP webserver and the Django framework are installed on this instance. With this setup, the Amazon EC2 instance is able to serve a simple Django website with basic features. WhichOne requires email to be sent during registration, and Amazon's SES provided a simple solution.

Configuring an email server for Django is simple with Amazon SES. In WhichOne's Django configuration file there are settings for the Amazon SES service. This service provides highly scalable and cost-effective bulk and transactional email-sending. With this service, WhichOne is able to send emails for registration.

3.3 Development Environment

Software development requires a few key tools. Common tools include the following:

- Text editor, for editing code

- Software version control, for keeping track of changes
- Test tools, for testing the code

Developing WhichOne required editing HTML, CSS, JavaScript, and Python code. Often software development requires an integrated development environment that typically provides a source code editor, build automation, and debugging tools. For WhichOne a simple text editor called gedit, available with the Ubuntu Linux operating system, was used.

Version control is important in software development. For WhichOne, version control was needed to track changes, and keep the source code safe in a remote location. Git, the revision control software, was chosen for tracking changes to the source code. To keep the source code safe in a remote location, free services provided by Assembla were used. The company Assembla provides source code storage in the cloud.

The client and server side of WhichOne needed to be tested during development. For the client side, manual testing with Google's Chrome browser (version 28.0.1500.44), FireFox (version 21.0), and Internet Explorer (version 10.0) browsers were used. For testing the server side of WhichOne, the Django framework offers a development web server. This web server runs locally on a developer's development computer. The Django development web server will support several users, but is not suitable for a production website. This development web server provides trackbacks on the console, useful debugging information, and auto restart when files are changed. These features come at a cost and the Django development web server has not been optimized for production.WhichOne has the ability to send emails to users. Currently new users are sent an email to authenticate. To test email sending and receiving, a Python library was used. The library is named smtpd, which stands for Simple Mail Transfer Protocol

daemon. This library was simple to use after installation, requiring only one line in a terminal to execute:

- python –m smtpd –n –c DebuggingServer localhost:1025

Chapter 4

WhichOne: Architecture

4.1 Client-side

During testing three popular browsers were used, Google's Chrome browser (version 28.0.1500.44), FireFox (version 21.0), and Internet Explorer (version 10.0). These browsers were chosen because of their popularity and ability to render the HTML, CSS, and JavaScript on WhichOne.

Many tools are available to measure website use, and three most popular Web analytics tools are Google Analytics, ClickTracks, and Coremetrics [4]. Google Analytics is JavaScript that runs on the client and generates detailed statistics about the visitors to a website. Because the content of any social networking site is generated by users, their behaviors are critical to the success of the sites [5]. Google Analytics is free and simple to use. After registering with Google Analytics, a code snippet is made available. The code snippet is then put in the HTML of each page where statistics need to be collected.

There are other methods of collecting user statistics, Google Analytics was chosen because of its reputation and ease of use. When it comes to web mining, data can be obtained from client-side, server-side, proxy servers, or organization's data bases [6].

4.2 Server-side

When creating a web application, the popularity of the web application is often unpredictable. Because of this unpredictability, purchasing hardware for a server at the early stages of development is uncommon with web applications. The on-demand, pay-as-you-go model creates a flexible and cost-effective means to access compute resources [7]. WhichOne's development team is small and unable to support full time IT members.

Amazon's EC2 services provide resizable compute capacity in the cloud. Their services are designed to make web-scale computing easier for developers. The EC2 instance used for WhichOne is running Ubuntu 12.04 as a t1.micro instance. Ubuntu was chosen because of its flexibility and community support. WhichOne was developed on an Ubuntu; the switch to the EC2 instance for the production site was straightforward. Amazon also provides some statistics for each instance; Figure 4.1 shows a subset of the provided statistics.

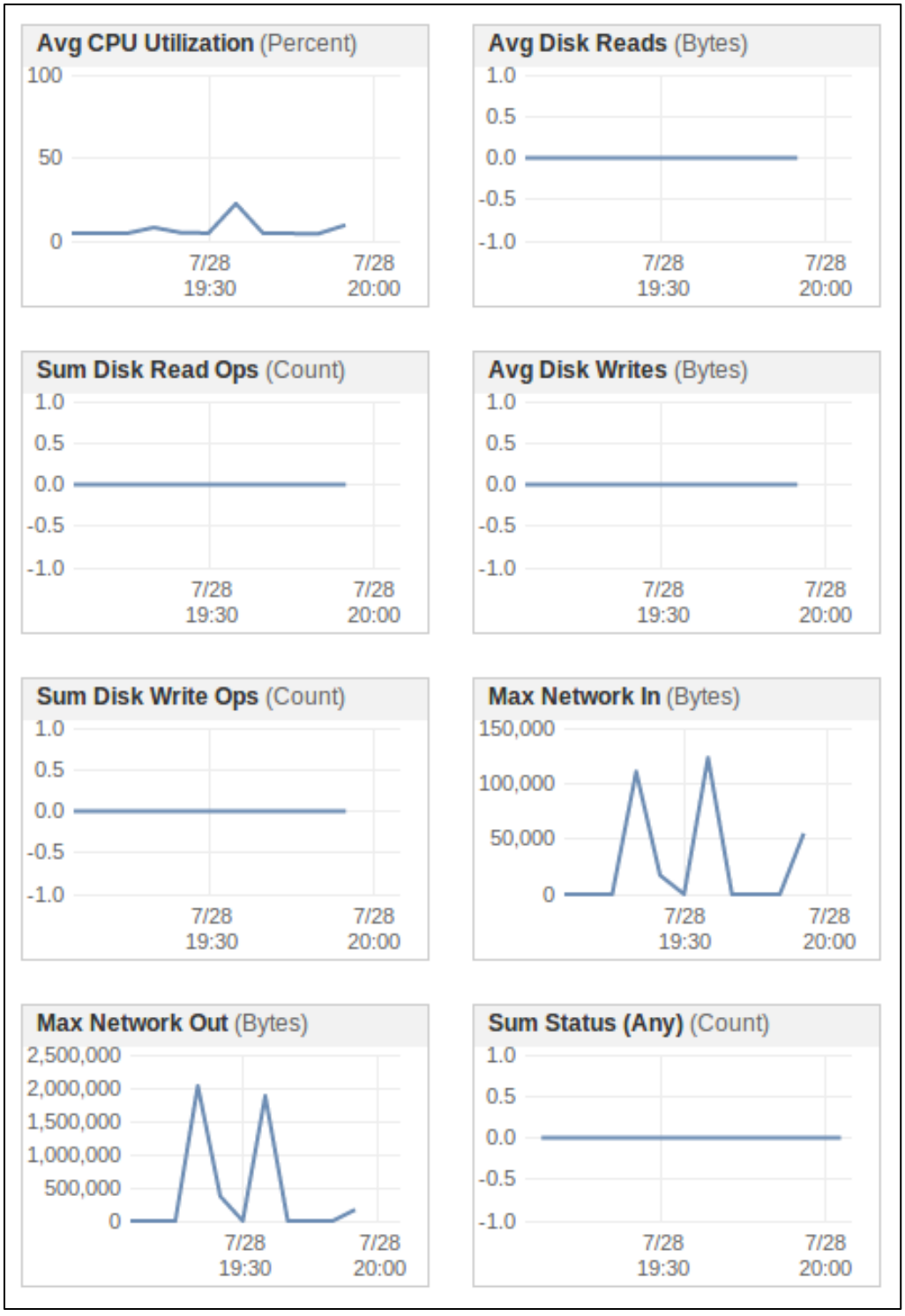


Figure 4.1: One hour of WhichOne's Amazon EC2 instance metrics.

Once the instance was running, Apache Web Server was installed. Apache HTTP server software is a web server software program. The software listens on port 80 for HTTP requests. These requests come from the clients that want to access the website. Apache Web Server is a freely available, UNIX-based web server. Apache is the most popular Web server running today, accounting for more than 53% of all Web domains on the internet [8]. Second, Apache is fully featured, high performance Web server, superior than many other UNIX-based Web servers in terms of functionality, efficiency and speed [9]. Because of its popularity, Apache has large community support making common problems quick to solve.

Apache serves HTML to the client from the Django framework. Django is an open source web application framework. It is based on the python programming language and implements the MVC pattern [10]. The Django framework is free, simple to use, and has a large community support. Features of the framework include templates for HTML, object-oriented Python, integrated user administration tools, and Django handles the database interfacing. With Django handling the database interfacing, the work required for optimizing SQL is no longer necessary. These features of the Django framework encourage rapid development and clean, pragmatic design.

The database interface is handled by Django, but the choice of database server is up to the developer. WhichOne uses a MySQL database server. It is a true multi-user, multi-threaded SQL database server [11]. MySQL is fast and flexible enough to allow storage of logs and pictures in it [12]. The main features of MySQL are speed, robustness and ease of use [11]. MySQL is supported by Django and is capable of handling large amounts of multimedia data. The following eight tables create the MySQL database for WhichOne:

- whichone_poll

- whichone_hashtag_polls
- whichone_hashtag
- whichone_choice
- whichone_choice_voters
- whichone_userprofile
- whichone_feedback

The database design consists of seven tables and the relationships between these tables can be seen in Figure 4.2. These seven tables represent the seven data objects available for WhichOne to manipulate. A user is added to the User table when an individual registers with WhichOne. Once a user has registered, they are able to submit feedback, create polls, and vote. The Choice, Feedback, and Poll tables use user data in their tables. User information is a many-to-many relationship with the Choice table. Many users can vote for a specific Choice, and many Choices can be voted for by many Users. Feedback, and Poll tables record the user as a foreign key for each feedback or poll. This allows WhichOne to collect user information on the creator of each. Hash tags are created when a user creates a Poll. The relationship between the Poll and HashTag table is many-to-many. A poll can have many hash tags, and a hash tag can be assigned to many polls. Each row in the Choice table has one-to-many relationship with the Poll table. This allows multiple choices to be assigned to one poll. When creating a Choice, WhichOne supports text data or an image. These two tables, ImageChoice and TextChoice have a one-to-one relationship with the Choice table. Each row in the Choice table has either one ImageChoice or TextChoice assigned to it.

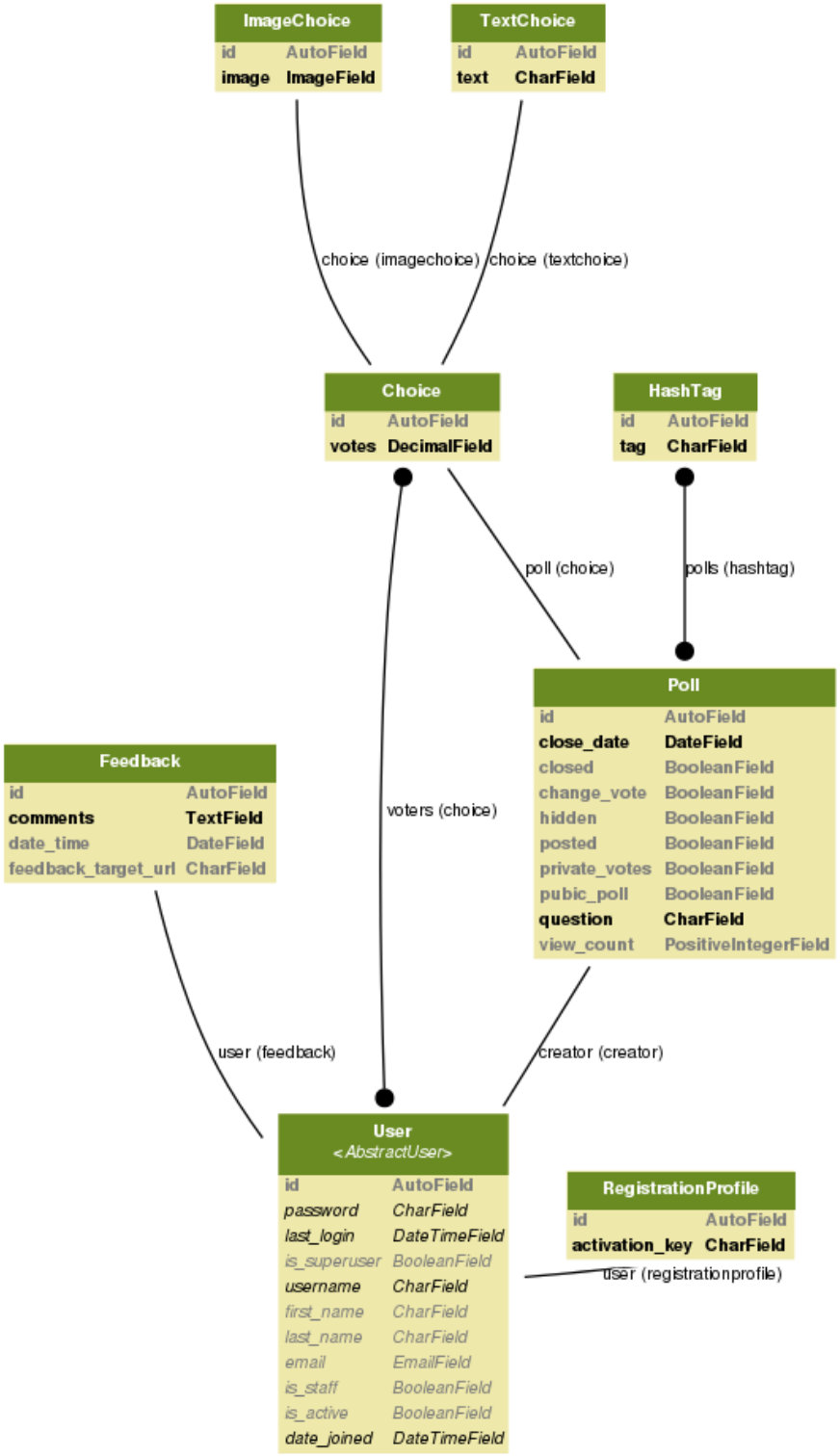


Figure 4.2: WhichOne database design.

To support sending and receiving emails Amazon's SES, another service provided by Amazon was used (simple solution). As with their EC2 instances, SES is on-demand, pay-as-you-go. It is inexpensive, reliable, scalable, and designed for use with the other Amazon Web Services. Amazon SES is configured in a Django settings file and allows for WhichOne to send emails to new registered users.

4.3 Development Environment

The development environment required a few key tools. Common tools include the following:

- Text editor, for editing code
- Software version control, for keeping track of changes
- Test tools, for testing the code

Developing WhichOne required editing HTML, CSS, JavaScript, and Python code. Often software development requires an integrated development environment that typically provides a source code editor, build automation, and debugging tools. For WhichOne a simple text editor called gedit, available with the Ubuntu Linux operating system, was used. Ubuntu is a free Linux operating system that is popular to develop with because of its flexibility and variety of open source tools available to developers.

Version control is important in software development. For WhichOne, version control was needed to track changes, and keep the source code safe in a remote location. Git, the revision control software, was chosen for tracking changes to the source code. It gives developers a complete copy of the software repository, allowing them to create their own private branches corresponding to their individual needs [13]. Git keeps the complete history of what changes have been merged in a tree format. Thus allowing

developers to think in terms of revisions they have integrated rather than low-level file differences between diverging branch snapshots [13].

To keep the source code safe in a remote location. The Assembla company provides source code storage in the cloud. Assembla provides 1 GB of free space for storing source code. The repositories can be private or shared with a team. Access to a repository is kept secure by using SSH private/public key pairs. Assembla also provides a variety of additional tools for development teams, including:

- Access to source from the web
- View commits from the web
- View Merge Requests from the web
- Email notifications for code commit events

For testing the server side of WhichOne, the Django framework offers a development web server. This web server runs locally on a developer's development computer. The Django development web server is free and provided with the Django framework. It will support several users, but is not suitable for a production website.

Chapter 5

Results

WhichOne has been active for over half a year. Using the mockups, a website was designed. The backend was developed using Django. WhichOne was tested on a development machine. Once development was complete, WhichOne was transferred to a production site hosted on Amazon Web Services. The following sections describe the WhichOne web application in its current state. Next the feedback about WhichOne provided by users is discussed, and actual use cases are listed. Last, total lines of code and timing data for WhichOne are discussed.

5.1 Qualitative Results

WhichOne was designed using the mockups created before development. User registration and Web 2.0 options were added. Figure 5.1-5.10 illustrates the current state of WhichOne.

Figure 5.1 below shows the login screen shown to a user who visits the WhichOne web application. If the user has an account, they can enter their username and password to login. If the user forgets their password, they can access the password recovery page by clicking on the “Set a new one” link. The password recovery page provides a text field where the user enters their email. Once the user enters their email, they are sent an email with a link to set a new password. On the login page, if the use has not registered, a link is provided to the registration page. The registration page is seen in Figure 5.2.

Log in

Username:

Password:

Log In

Don't have an account? Register!
Forgot your password? Set a new one.

Figure 5.1: WhichOne log in page

Figure 5.2: WhichOne registration page

To register the user provides a Username, email and password. WhichOne uses the username to assign polls a "creator." This name will be tied to each poll the user makes, and will be displayed with poll data. User names can be seen in Figure 5.3, Figure 5.4, and Figure 5.5. The email address provided for registration is used to confirm the user's authenticity. Additionally, the email is used to recover a user's password.

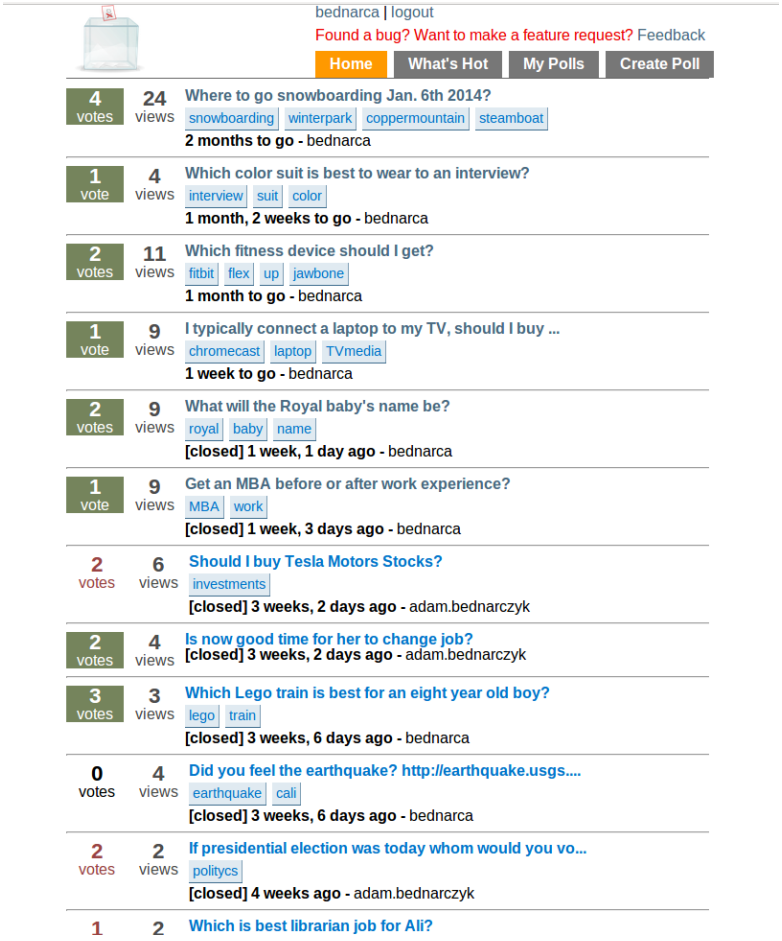


Figure 5.3: WhichOne home page

Figure 5.3 shows the home page that is visible to a user once they have successfully logged in. At the top of this page are the navigation buttons. The user is able to logout, submit feedback, or navigate the content of the site. The navigation buttons are "Home", "What's Hot", "My Polls," and "Create Poll." Under these buttons are the polls. The polls are listed in order of creation with the newest at the top. Each row shows details of the poll. The number of votes and views for the poll are on the left. To the right is additional information about the poll, including the Question asked, hash tags used, time

remaining until the poll is closed, and the creator of the poll. The vote status background color switches to green when the current user has voted for that poll. If another user has voted for a poll and the current user has not, the color of the vote text will be red.

To vote in the poll, the user clicks on the question text and is taken to a page displaying the question and choices available. Figure 5.4 shows the view of a single poll. Additionally, the hash tags displayed are clickable and enable a user to access a list of polls with the same hash tag. Figure 5.5 illustrates what a user would see when clicking on a hash tag.

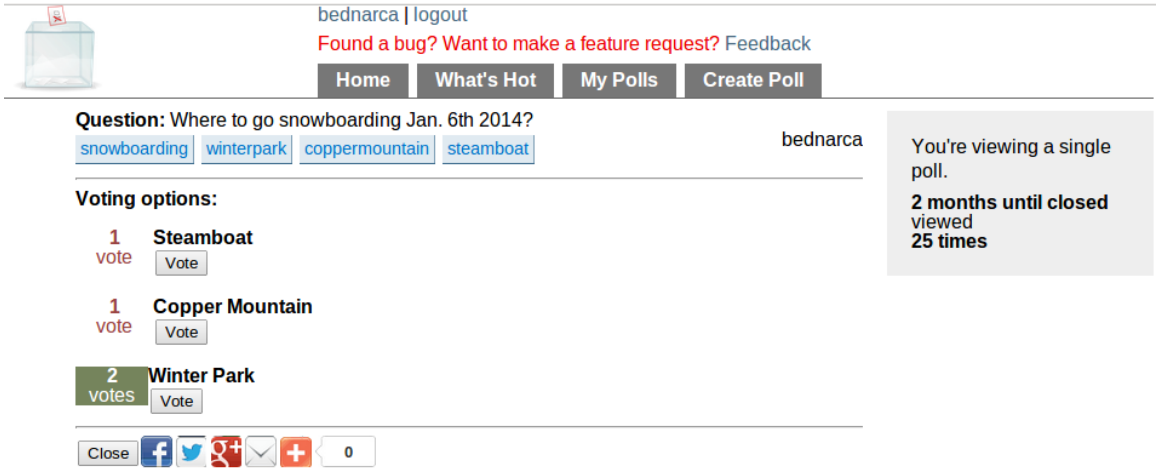


Figure 5.4: WhichOne view single poll

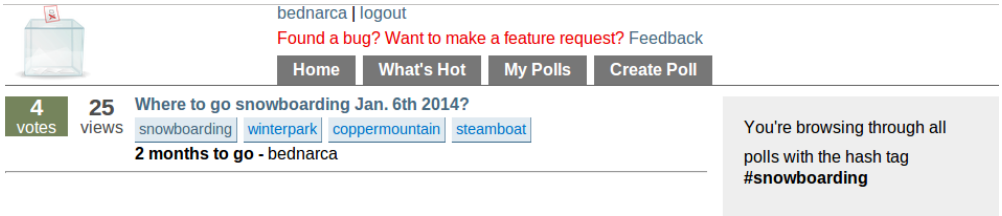


Figure 5.5: WhichOne polls with specified hash tag

When a user clicks on a poll they are taken to a page shown in Figure 5.4. This page shows details of a single poll. The question is at the top, along with the username of the poll creator, and hash tags assigned to the poll. Next the voting options are visible to the user. These are the choices assigned to the poll by the creator. Similar to the homepage, the green background informs the user they have voted and what they voted for. Red text will identify that another user has voted for a different option. Below the voting options are the share buttons. These buttons are provided as a service from AddThis, and support over 300 different methods for sharing the user's poll. Finally the right sidebar for this page provides information. This information informs if the poll is closed, or when it will be closed, and how many times it has been viewed.

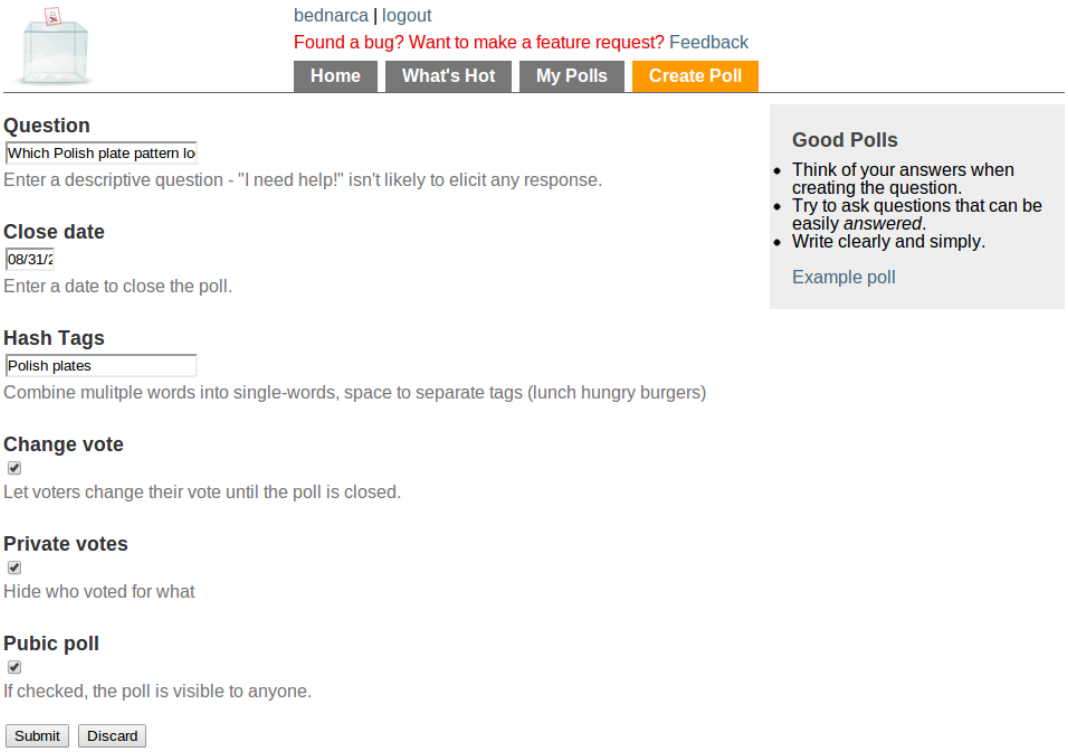


Figure 5.6: WhichOne create poll page

When the user clicks on the create poll button, they are taken to a page shown in Figure 5.6 above. This page contains the fields that need to be filled out to create a poll. The poll question and close date are required. Optional fields for each poll are the configuration and hash tags. Creating a poll with "Change vote" option enabled, enables voters to change their vote at any time before the poll is closed. The "Private Votes" option is to keep the votes of the voters private from the creator of the poll. If this box is not checked, the creator of the poll can view who has voted for each choice. Finally the "Public poll" option is used to make the poll visible to everyone, if checked, or only visible when shared via a link.

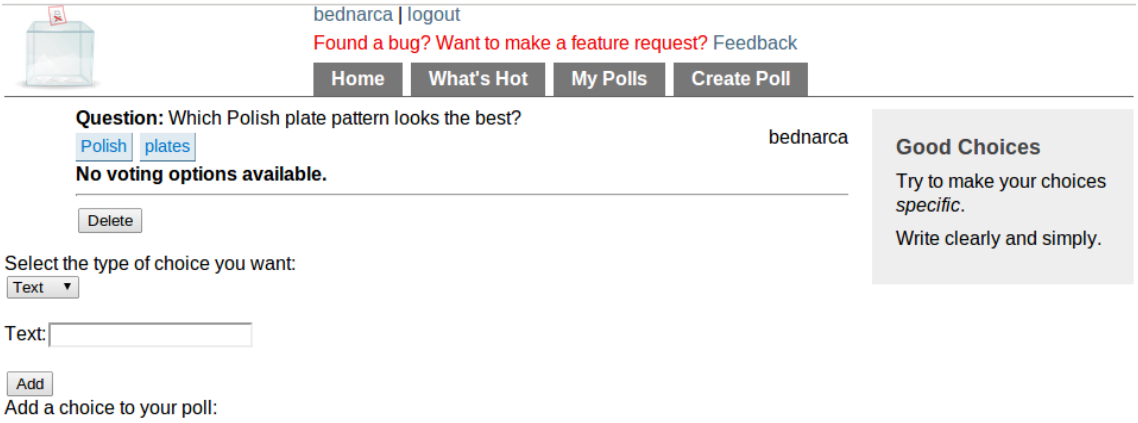


Figure 5.7: WhichOne create poll page select choices

When creating a poll, the poll creator has the ability to create three different voting options. The three options are plain text, a link, or an image. Figure 5.7 illustrates how the poll creator can enter text for a voting option. Text and link data are handled the same through the text box, while the image option is available on the image tab. If the image option is selected, the poll creator is able to upload an image to the WhichOne web

application and use it in their poll. Poll can contain any type of voting option available, there are no limits to text only polls or image only polls. Figure 5.8 shows the option for uploading an image to a poll. Figure 5.9 shows a posted poll with image voting options.

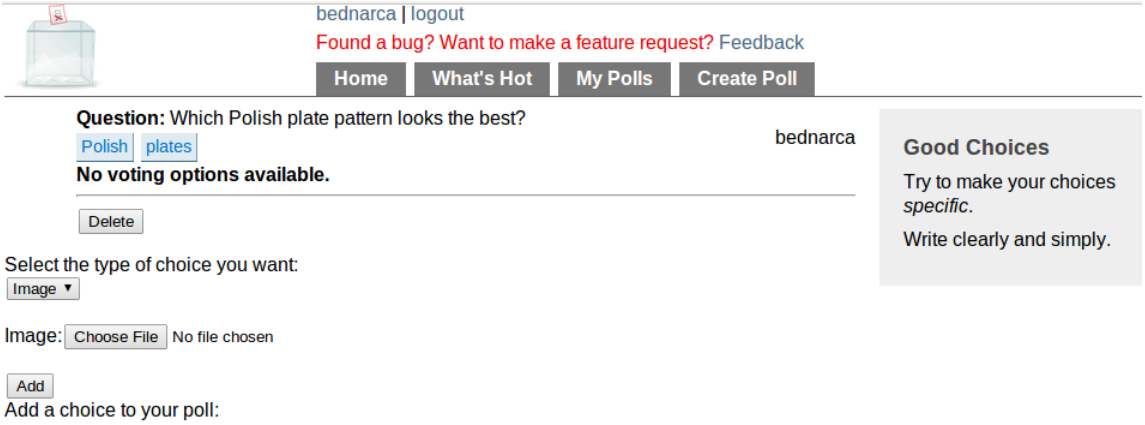


Figure 5.8: WhichOne poll image choice submission

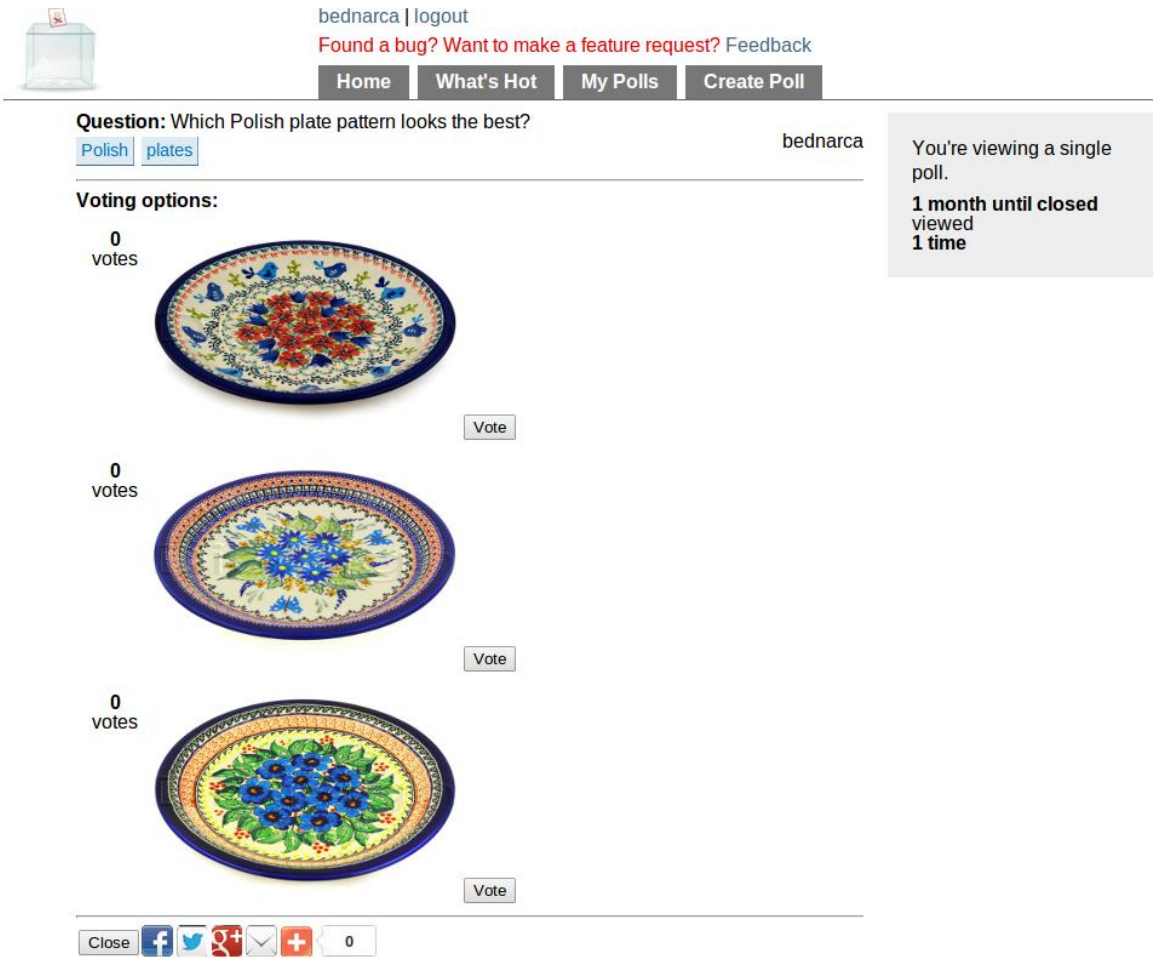


Figure 5.9: WhichOne poll with images

The mobile application for WhichOne is currently only available for Android, and provides the same features as WhichOne's web application. These features include creating, sharing, viewing, voting in polls, and uploading images for polls. In addition to the features available to the web application, the mobile application provides additional Android share methods. Figure 5.10 illustrates the share options available to a user of the WhichOne Android mobile application. The mobile application uses an Android

WebView to access the web application. The Android mobile application has not been published on the Android market yet.

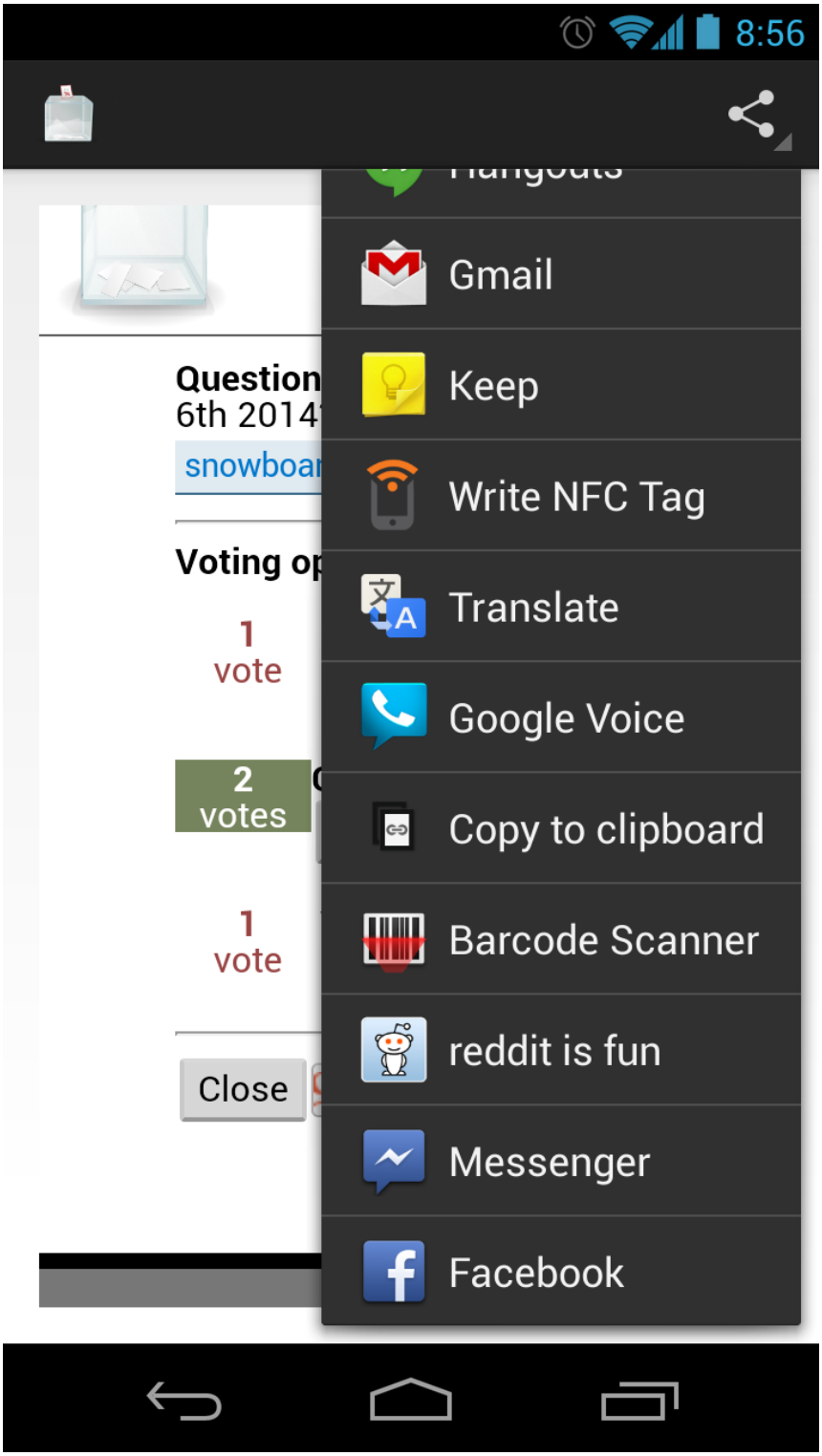


Figure 5.10: WhichOne mobile share options

5.2 Quantitative Results

5.2.1 Performance Measurements

Page serve time from the server is important for users. Users need to have instant load time in order to enjoy their experience using a web application. Timing data was collected for WhichOne using Google Analytics and Google Chrome. Table 5.1 shows the average page load time in seconds for the top ten viewed pages.

	Page	Avg. Page Load Time (sec)	Pageviews ↓	Page Load Sample	Bounce Rate	% Exit	Page Value
		1.41 Site Avg: 1.41 (0.00%)	**1,019** % of Total: 100.00% (1,019)	**3** % of Total: 100.00% (3)	**24.56%** Site Avg: 24.56% (0.00%)	**11.19%** Site Avg: 11.19% (0.00%)	**$0.00** % of Total: 0.00% ($0.00)
1.	/home	0.00	**293**	0	51.85%	15.70%	$0.00
2.	/	0.00	**147**	0	13.64%	19.05%	$0.00
3.	/viewPoll?id=B4zf444S	0.00	**77**	0	33.33%	10.39%	$0.00
4.	/accounts/login/	1.41	**63**	3	8.33%	20.63%	$0.00
5.	/viewMyPolls	0.00	**39**	0	100.00%	10.26%	$0.00
6.	/createPoll	0.00	**28**	0	0.00%	3.57%	$0.00
7.	/viewPoll?id=tWZB444S	0.00	**26**	0	50.00%	7.69%	$0.00
8.	/viewPoll?id=IR0Y444S	0.00	**25**	0	0.00%	0.00%	$0.00
9.	/viewHot	0.00	**23**	0	0.00%	4.35%	$0.00
10.	/viewPoll?id=DgCl444S	0.00	**21**	0	100.00%	9.52%	$0.00

Table 5.1: Average Page Load Time (sec)

The collected data shows that the most viewed pages are loading in less than a second. Google Analytics provides page speed score and speed suggestions for every page. Table 5.2 shows the speed suggestions from Google Analytics for WhichOne.

	Page	Pageviews	Avg. Page Load Time (sec)	Page Speed Suggestions	Page Speed Score
1.	/home	144	0.00	3 total	9
2.	/createPoll	45	0.00	3 total	9
3.	/	33	0.00	3 total	9
4.	/viewMyPolls	28	0.00	3 total	9
5.	/viewHot	26	0.00	3 total	9
6.	/viewPoll?id=27	22	0.00	3 total	9
7.	/viewPoll?id=21	20	0.00	3 total	9
8.	/viewPoll?id=6	19	0.00	3 total	9
9.	/viewPoll?id=23	16	0.00	3 total	9
10.	/viewPoll?id=29	15	0.00	3 total	9

Table 5.2: Google Analytics Speed Suggestions

The following are suggestions provided by Google Analytics suggestion summary. They will be considered in future work.

- Avoid Redirects
  - Avoid landing page redirects
- Minimize payload
  - Serve scaled images
- Other
  - Leverage browser caching

Redirects are present in the WhichOne web application when a user has not logged in. If a user has not logged in and they click the Create Poll button, they are

redirected to login. One image is used for WhichOne and it is scaled to fit the needs on different pages. Separate images could be used for each page.

In addition to Google Analytics, WebPageTest provides a free online tool that collects timing data by accessing a specified website. WebPageTest is an open-source tool used in efforts to make the web faster. The web tool uses a user created configuration consisting of site to test, geographic location to access the site from, browser to access the site with, number of tests to run, and to measure the first view only or include a repeat view.

						Document Complete			Fully Loaded		
Load Time	First Byte	Start Render	Speed Index	DOM Elements	Result (error code)	Time	Requests	Bytes In	Time	Requests	Bytes In
1.545s	0.811s	1.166s	2200	28	0	1.545s	8	177 KB	5.694s	10	260 KB

Table 5.3: WepPageTest results

Table 5.3 shows the Load Time for WhichOne index page (/home). The load time was 1.545s with a Speed Index of 2200. This Speed Index metric measures how quickly the page contents are visually populated (where lower numbers are better). With a score of 2200, WhichOne is in the 25th percentile. Data for the Whats Hot (/viewHot) and a single HashTag(/viewHashTag(#snowboarding) pages are available in the Appendix. Additional data collected from the WebPageTest for /home is available in the Appendix.

5.2.2 Software Engineering Metrics

WhichOne was developed part-time, five days a week for two months. The estimated total development time is approximately 140 hours. While developing WhichOne, a bug tracking tool was not used. Some record of bug tracking was kept in the

GIT repository. Reviewing the commits in the repository shows that at least four bugs were recorded and fixed with committed code.

WhichOne consists of 6,569 lines of code. JavaScript imported libraries made up the majority of the code at 4,118 lines. The second largest portion of code is the HTML totaling at 1,151 lines. Python code written to control and manipulate data with the Django framework totaled 722 lines. A significant number of lines of code are saved by using Django's built-in administrator tools, and templates. CSS files used for the look of the website, totaled 530. Additional statistics about the lines of code are shown in Table 5.4 below.

Extension	Files(%)	Lines(%)	Lines/file
Css	7 (11.29%)	585 (14.79%)	83
Html	20 (32.26%)	935 (23.64%)	46
Js	12 (19.35%)	4118 (104.12%)	343
Py	18 (29.03%)	800 (20.23%)	44

Table 5.4: Lines of Code Statistics

During the 244 days of development, 22 active days (9.02%), a total of 71 commits were made (average 3.2 commits per active day, 0.3 per all days). The average commit size was 6 files changed with 60 new lines, and the largest commit size was 32 files changed with 5060 new lines. Table 5.5 shows the commits per month and includes lies added or removed for each month.

Month	Commits	Lines added	Lines removed
2013-07	23	5298	1792
2013-06	5	79	1266
2013-05	4	304	134
2013-03	6	322	212
2012-12	2	14	15
2012-11	31	1854	497

Table 5.5: Commits per Month

5.2.3 Cost

WhichOne is WhichOne is hosted on an Amazon Web Service t1.micro instance. These services can easily scale to support additional need, and are inexpensive compared to hosting a web application on local hardware. From the timing data collected from WebPageTest, and seen in Table 5.5, 10 requests consume 260 Kilobytes. Figure 4.1 shows one hour of WhichOne's Amazon EC2 instance metrics. When testing WhichOne with WebPageTest, the micro instance CPU usage jumped to 20%. With these metrics and additional metrics from Google Analytics, cost estimates can be made. Metrics from Figure 5.11 show that most users visit at least 4 pages. If a visitor visits each day for 30 days, the total estimated data consumption for one user is 3.12 Megabytes per month. Using this estimate for one user Table 5.6 has been created to show the estimated cost for additional users.

Number of Users	Data Consumed (GigaBytes)	Estimated Cost Per Month($)
1	0.00312	3.66
10	0.0312	3.66
1000	3.12	3.66
10000	31.2	5.61
100000	312	39.31
1000000	3120	376.26
10000000	31200	3428.8

Table 5.6: Estimated cost per user

Currently there has not been sufficient CPU usage metrics to determine how many users using WhichOne will be supported by the micro instance. Bandwidth and CPU usage are not the only attributes that need to be considered when estimating cost. Table 4.7 has been created to show the estimated cost for disk space required for uploaded images.

Storage Space(GB)	Estimated Number of Images (2Mb / image)	Cost($) / month
100	**51,200**	**7**
1000	**512,000**	**100**
10,000	**5,120,000**	**1,000**

Table 5.7: Estimated cost per image

5.3 Customer Feedback

User feedback is important in Web 2.0 web applications. Currently, users for WhichOne are friends and family members. The users were selected because of their ability to provide feedback and understand WhichOne is in development. The feedback given for WhichOne was collected in two ways. The first was through active user

feedback collection using a feedback button on the web application. Google Analytics was the second method used for collecting feedback. Below is a list of user feedback submitted through the feedback button.

- Polls need to support images
- Add Facebook share button

In addition to this feedback, several requests were made to improve the usability of the user interface. Suggestions were made about the text on buttons, and text labels on text fields.

The second method of collecting feedback was through Google Analytics. Google Analytics provided some insight into how WhichOne is being used by users. Figure 5.11 shows the visitor flow for users using different browsers.

Figure 5.11: Visitor flow for users using different browsers

From this visitor flow data, it appears that Internet Explorer users do not create polls. Information like this is important in designing a user friendly web application. Figure 5.12 below shows the visitor flow for users using mobile browsers verses standard browsers.

Figure 5.12: Visitor flow for users using platforms

Direct user feedback and the visitor flows provide a great resource for determining the user friendliness of a web application and feature requests. Users provide specific details on what about the web application is frustrating them or what they would like to see added or changed. The data collected by Google Analytics shows how the web application was used. This data can tell a story that a user might not recognize and therefore not report. For example users may be clicking through links to access a specific

page that needs to be accessible from the home page. Google Analytics also provided information on audience engagement, average time a user is on a page, and visits from social networks. This data is available in the Appendix.

A variety of use cases were anticipated and analyzed during the development of WhichOne. This list of use cases for WhichOne is shown below.

- As a granddaughter, I want to know where my family wants to celebrate grandpa's 100th birthday so that we have a successful party.
- As an author, I want to know which book cover design looks the best so that I can sell more books.
- As a person looking to buy new shoes, I want to know which shoes would match my outfit so that I can look the best at a good price.
- As a curious person, I want to know which Olympic opening ceremony was the most memorable during the last 50 years.
- As a curious person, I want to know which jellybean flavor is my family's favorite.

The themes of these use cases were popular with users, but additional use cases became present when users started to use WhichOne more. A list of actual use cases are below.

- As a party host, I want to know which food item at my party was the best.
- As a bus driver coordinator, I want to know if the weather is good enough for my drivers to get on the road.
- As someone planning a vacation, I want to know where to go, so I can enjoy my vacation.

The first new use case was created on WhichOne by the host of a party. The host wanted to know which one of the food items served was the guests' favorite one. A use case of post event feedback from party was not anticipated before development.

Douglas Becker, Frisco Independent School District Transportation Director asked 200 bus drivers reporting to him, if the weather was good enough in their neighborhood to drive children to school. The director typically calls only some of his drivers to ask them if they think the roads in their area are drivable. In this case the coordinator created a poll and asked all his drivers. He quickly obtained more accurate assessment of the road conditions.

Last, the user was asking for advice on where to go for vacation. In this case the user was asking where to go snowboarding. This user shared his poll with his friends and family to determine where to go snowboarding on a specific date.

Chapter 6

Conclusion

We presented WhichOne, a new approach to asking questions using a Web 2.0 web application. The web application has been active for over half a year providing users a tool to get their questions answered. WhichOne brings Web 2.0 features of hash tags, and social networking sharing that make it different than previous work.

6.1 Contributions

WhichOne contributes Web 2.0 features of hash tags, and social network sharing to user created polls. Users are able to create polls based on questions they have, and send their poll to the target audience using social network sharing.

6.2 Lessons Learned

Five things that worked during the development of WhichOne:

- Make sure the pieces will fit together: Research the frameworks and tools that the development team plans to use. Make sure they work together. This includes frameworks, databases, web servers, domain hosting, and web hosting.
- Setup a simple development environment: try to use as few tools as possible. There is less of a chance something going wrong.
- Limit the number of unknowns: There is a lot to learn, use skills the development team already has for as many tasks as possible. To save time, pick known tools, ones the development team has experience using.
- Lack of user interface design skill: If the development team lacks a specific skill, seek outside help.

- Use tools with good support: Community support for tools is important when developing a new web application. When there is a problem, often the best source of a solution is the community that uses the tool and supports it by providing answers to questions. Community supported tools will also have a longer life than unsupported tools.

Five things that didn't work during the development of WhichOne:

- Writing social networking button code: There are too many social network sharing methods, it is best to stick with an all in one service
- Styling information in HTML: Styling was spread throughout the HTML code and difficult to modify and keep organized, a single CSS file is the best solution
- Hash tag cloud: WhichOne originally had planned to use a hash tag cloud displaying hash tags in a cloud with the most popular hash tags in larger font, it became difficult to read when the number of hash tags increased
- Share earlier: Development of WhichOne was oringally planned to be a secret until it was complete and ready for the masses, this resulted in unexpected feedback, release early
- Automated testing: Manual testing is time consuming and might not get the needed coverage, try to automated testing as soon as possible

Five things that would be nice to have:

- International support: Support different language
- Improve response times: Add an additional AWS instance and implement load balancing between the two instances

- Expanding costs plan: Supporting additional users will cost more and additional funding will be needed
- Use human identification: Currently poll creation and registration can be done without human interaction. This can lead to unwanted traffic to WhichOne and frustration for users.
- Google Analytics suggestions: Based on Google Analytics optimizations to WhichOne could be made to improve the speed of loading the web application, and search engine results.

6.3 Roadmap for Future Work

Based on the feedback provided by users and Google Analytics, the following list of future work has been created.

- Additional sharing options: A suggestion was made to create a friends list of WhichOne web application users and allow users to share with specific friends using the friends list.
- Weighted Polls: Sometimes an answer is not black and white, weighted polls would provide a different type of feedback to a user's poll.
- Improved Mobile application: Improve the quick access and response time for polls by improving the mobile application
- Improved user interface: Some modifications to the user interface have been suggested. These suggestions include changing button names, labels on text boxes, and specifically the time until a poll closes to be "time from now".

Some design decisions were not address in the development of WhichOne. Internationalization is a potential future for WhichOne, and would require global access. Currently WhichOne is only available in English. Also the current location of the

Amazon EC2 instance hosting WhichOne is located on the East coast of the United States.

6.4 Relationship to Prior Work

Creating a poll on the internet is not new. There are several companies that currently provide this service as a web application. The following list has been created and provides some details of prior work.

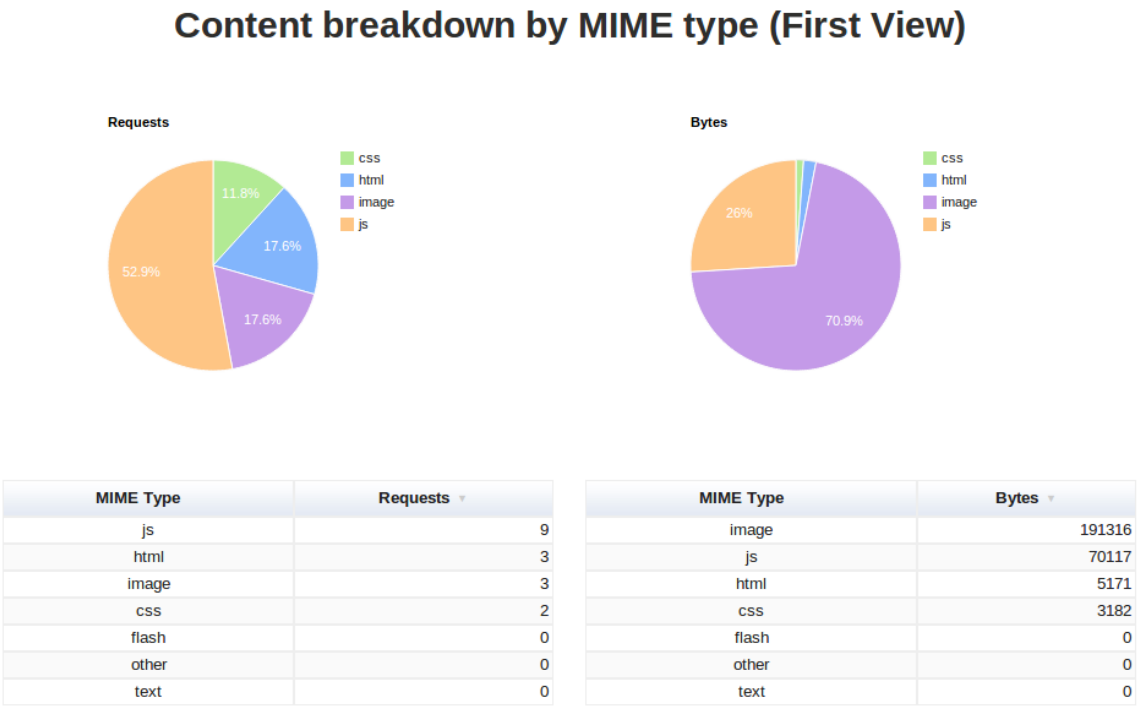
- SurveyMonkey – A free online survey software and questionnaire tool.
- Ask.com – Question answering service that delivers the answers from the web and real people.
- Zanda - Social rating site where users can find what the world has to say about anything.

SurveyMonkey provides online surveys for a range of questions and provides a robust reporting with real-time charts and graphics created from data collected from each survey. This web application is different because it focuses on a set of questions where WhichOne focuses on one simple question.

Ask.com allows users to ask a question and they do not have to supply the answers. This opens the focus of their site on the discussion of a question, WhichOne focuses on getting answers.

Zanda provides online comparisons. These comparisons allow users to vote for different choices and discuss the items being compared. Additional items can be added to the comparison. This site focuses on comparisons between objects and people but does not focus on personal questions that a user might ask their social network. WhichOne allows for comparisons and the creation of polls for a user to ask their social network for feedback.

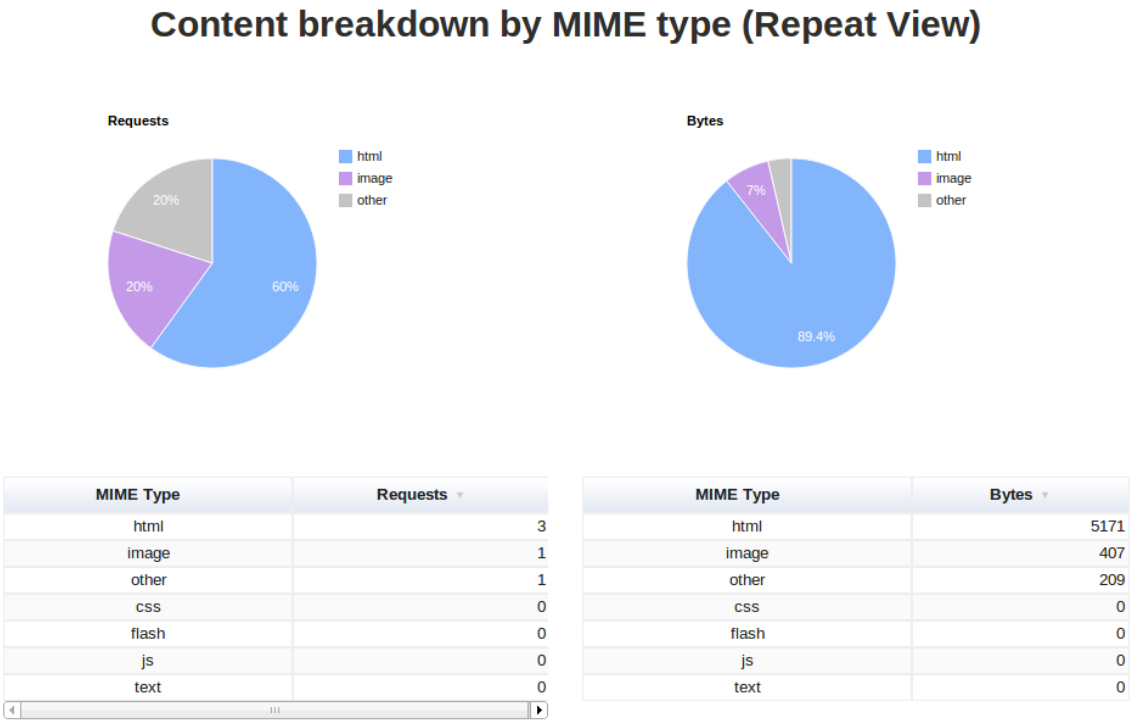
Appendix



MIME Type	Requests
js	9
html	3
image	3
css	2
flash	0
other	0
text	0

MIME Type	Bytes
image	191316
js	70117
html	5171
css	3182
flash	0
other	0
text	0

Figure A.1: Content breakdown for /home first view



MIME Type	Requests
html	3
image	1
other	1
css	0
flash	0
js	0
text	0

MIME Type	Bytes
html	5171
image	407
other	209
css	0
flash	0
js	0
text	0

Figure A.2: Content breakdown for /home repeat view

Performance Results (Median Run)

						Document Complete			Fully Loaded		
	Load Time	First Byte	Start Render	Speed Index	DOM Elements	Time	Requests	Bytes In	Time	Requests	Bytes In
First View (Run 8)	1.146s	0.169s	0.445s	411	73	1.146s	18	319 KB	1.146s	18	319 KB
Repeat View (Run 4)	0.509s	0.134s	0.419s	400	73	0.509s	4	17 KB	0.635s	5	18 KB

Table A.1: Performance results for /viewHashTag

Content breakdown by MIME type (First View)

MIME Type	Requests
js	9
html	3
image	3
css	2
flash	0
other	0
text	0

MIME Type	Bytes
image	191311
js	70130
css	3182
html	3171
flash	0
other	0
text	0

Figure A.3: Content breakdown for /viewHashTag

Performance Results (Median Run)

						Document Complete			Fully Loaded		
	Load Time	First Byte	Start Render	Speed Index	DOM Elements	Time	Requests	Bytes In	Time	Requests	Bytes In
First View (Run 5)	1.505s	0.409s	0.710s	720	602	1.505s	18	321 KB	1.505s	18	321 KB
Repeat View (Run 5)	0.787s	0.416s	0.714s	700	602	0.787s	4	19 KB	0.903s	5	21 KB

Table A.2: Performance Results for /viewHot

Content breakdown by MIME type (First View)

MIME Type	Requests
js	9
html	3
image	3
css	2
flash	0
other	0
text	0

MIME Type	Bytes
image	191310
js	70384
html	5353
css	3182
flash	0
other	0
text	0

Figure A.4: Content breakdown for /viewHot

Visits	Pageviews
115	976
% of Total: 100.00% (115)	% of Total: 100.00% (976)

Visit Duration	Visits	Pageviews
0-10 seconds	47	72
11-30 seconds	11	37
31-60 seconds	3	9
61-180 seconds	24	123
181-600 seconds	8	49
601-1800 seconds	13	349
1801+ seconds	9	337

Figure A.5: Audience engagement visit duration

Visits	Pageviews
115	976
% of Total: 100.00% (115)	% of Total: 100.00% (976)

Page Depth	Visits	Pageviews
1	24	24
2	39	78
3	7	21
4	4	16
5	7	35
6	2	12
7	3	21
8	3	24
10	1	10
11	1	11
12	4	48
13	4	52
14	3	42
15	3	45
19	1	19
20+	9	518

Figure A.6: Audience engagement page depth

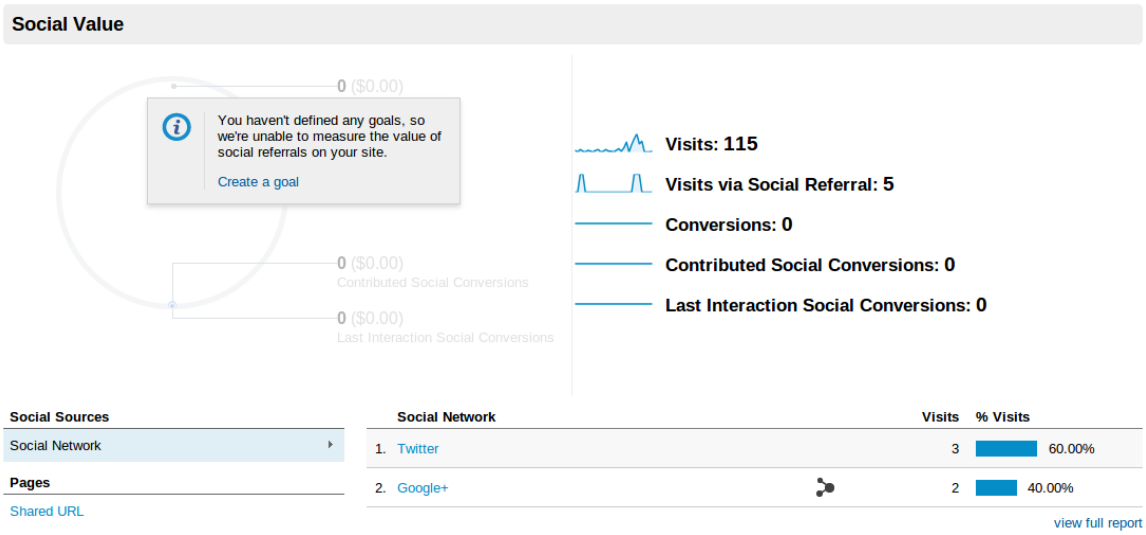


Figure A.7: Social visitor

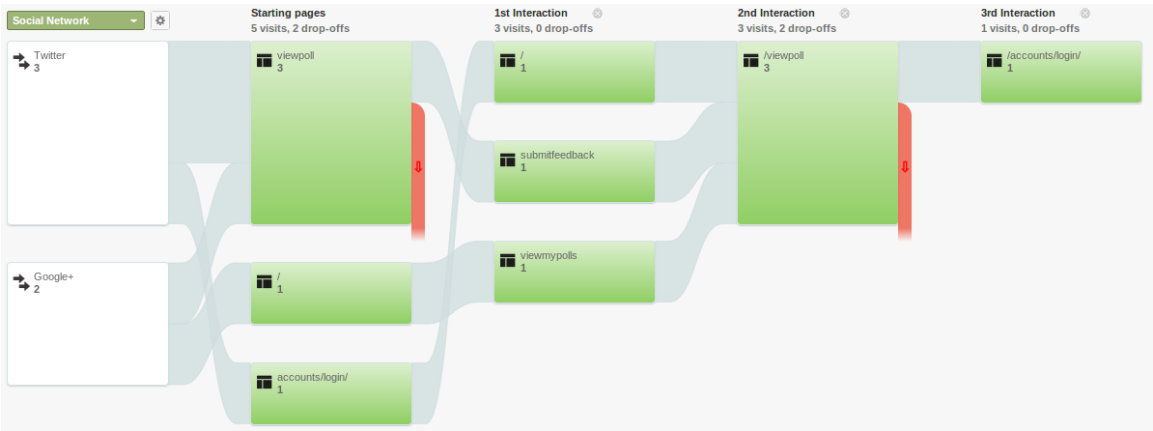


Figure A.8: Social visitor flow

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Vita

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